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## PROBLEMS FOR SOLUTION.

### ARITHMETIC.

152. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, O.

An operator on 'Change gains 5% on his *daily capital* every *odd* day of a business-week, and loses 5% of the same capital every *even* day of same week. What per cent. of his *original capital* will he have gained, or lost, at the end of a business-week?

153. Proposed by J. C. CORBIN, Pine Bluff, Ark.

Find some two-figure numbers, such that if they be squared, then the figures interchanged and the resulting numbers squared, the resulting products will consist of the same digits in reversed order.

### ALGEBRA.

153. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Eliminate  $x$ ,  $y$ ,  $z$  from the equations,

$$\begin{aligned}x^2 + yz &= a, \\ y^2 + xz &= b, \\ z^2 + xy &= c, \\ x + y + z &= 0.\end{aligned}$$

154. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, O.

Show that the equation,  $x^4 + qx^2 + s = 0 \dots (1)$ , can not have three *equal* roots.

155. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, O.

If the roots of the cubic  $x^3 + 3px^2 + 3qx + r = 0$  be in harmonical progression,  $2q^3 = r(3pq - r)$ .

156. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics in Drury College, Springfield, Mo.

$$(z+x)a - (z-x)b = 2yz.$$

### CALCULUS.

145. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

Find the surface bounding the volume required in problem 102.

146. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

$$I = \int_0^{\frac{1}{2}\pi} \sqrt{[p + \frac{1}{2}q^2] - (\frac{1}{2}q + \cos\theta)^2} d\theta = \text{what?}$$

147. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

Find volume common to the two solids

$$(x/a)^{\frac{2}{3}} + (y/b)^{\frac{2}{3}} = (z/c)^{\frac{2}{3}}, \quad (y/b)^{\frac{2}{3}} + (z/c)^{\frac{2}{3}} = (x/a)^{\frac{2}{3}}$$

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### MECHANICS.

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136. Proposed by F. T. WRIGHT, Ph. B., Schenectady, N. Y.

In an air brake test a train moving at 22 miles an hour on a down grade of one per cent. was stopped in 91 feet. There was 94 per cent. of the train braked. Taking the fractional resistance as 8 pounds per ton, find the net brake resistance per ton.

137. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

A uniform inextensible string rests against the inner side of a smooth elliptic wire semi-axes  $a$  and  $b$ , and is repelled from the foci and the center by the following forces:  $\mu/rd$  and  $\nu/r'd$  emanating from the foci, and  $\pi c/d$  from the center, the distances of any point on the string from the foci being  $r$  and  $r'$ , respectively, its distance from the center being  $c$ , and the semi-conjugate diameter corresponding to the point being  $d$ . Find the pressure on the wire at any point.

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### DIOPHANTINE ANALYSIS.

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99. Proposed by JOSIAH H. DRUMMOND, LL. D., Portland, Me.

Find a general expression for the radius of the sphere which, dropped in (or partly in) a right cone full of water, will displace the most water; the radius of the sphere, and the width, height and slant height of the cone to be rational integral numbers.

100. Proposed by LON C. WALKER, A. M., Professor of Mathematics, Petaluma High School, Petaluma, Cal.

(a) Find the least three integral numbers such, that if to the square of each the product of the other two be added, the three sums shall be all squares.

(b) Find the two least integral numbers such, that not only each of them, but also their sum and their difference, when increased by *unity*, shall be all square numbers.

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### AVERAGE AND PROBABILITY.

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121. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

Find the average area of the pentagon formed by joining five random points on the surface of a given circle.

122. Proposed by F. M. PRIEST, St. Louis, Mo.

Suppose each of the nine digits to be placed in a wheel, and five of them drawn at random therefrom, and written down in the order drawn. What is the probability the number thus expressed will be greater than 50,000?